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The Economic Impact of the Federal Aviation Administration William J. Hughes Technical Center on Southern New Jersey

September 1999

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U.S. Department of Transportation
Federal Aviation Administration

William J. Hughes Technical Center
Atlantic City International Airport, NJ 08405

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16. Abstract

The William J. Hughes Technical Center has a major influence on the economy of Southern New Jersey. The Center is both a major employer and consumer of goods and services in the area. This report summarizes the results of a rigorous modeling effort to determine this impact.

Using the Regional Economic Models, Inc., (REMI) EDFS-53 Model, it was determined that the 10-year economic impact of the Center on Southern New Jersey was $3,000,000,000.

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Executive Summary

The National Airspace System (NAS) Systems Engineering and Analysis Division (ACT-500) of the Federal Aviation Administration William J. Hughes Technical Center selected Princeton Economic Research, Inc. (PERI) to conduct this study. Its purpose was to determine the economic contributions of the Technical Center to the economy of Southern New Jersey. These contributions encompass a broad range of effects including the impact of the Technical Center on local employment and the locally produced goods and services purchased by the Technical Center. Beyond the direct expenditures, the Technical Center purchasing actions have a multiplier effect on the local economy, reflecting the demand for local goods and services of the employees of the Technical Center and its contractors. The study showed the impact of the Technical Center on the Southern New Jersey gross regional product to be $279 million in 1997 and projected to be $3.0 billion over the next 10-years.

Economic analysts at PERI used the Regional Economic Models, Inc., (REMI) EDFS-53 model to estimate the effects of Technical Center spending on the local economy. This state-of-the-art model provided the full multiplier analysis, estimating the spending and re-spending in the local economy. It provided a tool for accounting Technical Center and employee spending to estimate the fraction that stays in the local economy and what fraction of that spending becomes local income and is re-spent in the local economy. In addition to the importance of the employment and payroll brought to the region, the employees of the Technical Center are technically sophisticated, with critical, specialized skills that are important to the region. The Technical Center attracts highly skilled workers and brings higher-quality employment opportunities to the workers of the region. This study provides evidence that the Technical Center has a significant effect on both the number of workers and the quality of jobs in the region.

Volunteer activities make an additional contribution to the Southern New Jersey region. Technical Center employees, contractors' employees, and their family members are active participants in local religious, civic, educational, recreation, and public safety organizations. PERI conducted a Technical Center employee and contractor community involvement survey to assess the level of volunteer activity. The survey showed that 78% of the Technical Center related households had one or more adults involved in volunteer activities in 1996. The overall cumulative contribution, in full-time year-round workers, was equivalent to 142 full-time workers. The volunteers contributed the equivalent of $3.7 million to the surrounding communities in donated time.

The study region included the counties of Atlantic, Cape May, Ocean, Cumberland, Burlington, Camden, Gloucester, and Salem. The Technical Center directly employs 1,573 people, not including its contractor employees. Of these employees, 1,423 live within the study region. The payroll of the Technical Center is $94.5 million, of which $85.5 million is earned by employees who live within the region. The Technical Center spent $190 million in 1996, of which over $140 million (70%) was spent with firms located within the study region.

The nine firms with the largest FAA contracts at the Technical Center have 1,038 employees and accounted for over $51 million in employee payrolls within the eight-county area in 1996. Almost all of the employees of these nine firms (97%) live in the eight-county Southern New Jersey area. These firms also have 53 subcontracts with other firms (mostly in the Southern New Jersey area) involving an additional 415 employees. They reported that their largest annual local expenditure in 1996 was for office space. Eight out of the nine firms lease office space near the Technical Center, accounting for approximately 140,000 square feet of commercial real estate. Other major local purchases include office supplies, travel-related services, and (for three firms in 1996) computer equipment. The nine largest firms purchased $5.4 million of these goods and services in the Southern New Jersey area in 1996.

The Southern New Jersey region is permanently more prosperous with more high quality jobs and a larger inflow of population as a consequence of the Technical Center presence. The effects are larger than would be estimated by counting Technical Center employees and their incomes alone or even including the contractors that perform vital Technical Center functions. The impact of the Technical Center is magnified, or multiplied, by the spending and respending of dollars in the economy. The Technical Center contracts for services are largely supplied locally, further increasing the multiplier beyond what would normally be the effect of a government operation. Furthermore, the employees and contractors are people who largely spend their personal resources on services produced locally, strengthening the local educational and construction sectors, to name only two. Finally, the region benefits by having a scientific and technical research facility that cannot be quantified.

Table EX-1 contains a summary of the aggregate contributions of the Technical Center to the regional economy. A 10-year total contribution is also provided, indicating the major sustaining value of the Technical Center to the region.

Table EX-1. Summary of Technical Center Impacts on the Local Economy

Area of Impact	1997 Impact	Ten Year Total Impact
In-Region Employment	5,900 Jobs	50,000-60,000 Person Years
Gross Regional Product (Dollars)	$279 Million	$3.0 Billion
Personal Income (Dollars)	$215 Million	$2.9 Billion

1. Introduction

Government organizations have become increasingly concerned with the quality of their operations. In addition, they have been charged by the National Performance Review (NPR) to conduct activities in "a more business-like fashion." That is, they are required to identify and serve, more effectively, all stakeholders including direct customers, the broader set of taxpayers, their employees, local businesses, and individuals affected by their activities. To meet this need, the Federal Aviation Administration (FAA) William J. Hughes Technical Center regularly examines its micro- and macro-management plans to determine the impact of its operation. One aspect of this examination is an assessment of the effects of the Technical Center on the economy and quality of life in the surrounding communities. Critical to this management effort is the ability to accurately catalog the value-added products it produces.

Some of the Technical Center products are produced for, and funded by, its customer base (e.g., results of aviation safety research, evaluations of new air traffic control (ATC) equipment, and maintenance of the current ATC system). The ultimate benefit is to the health and safety of the flying public. However, those mission-related products are only part of its contribution to the nation. To make a full evaluation, it is important to capture some of the value creation that is less direct in nature. This additional value shall be described as the benefits to the economy and quality of life in the surrounding communities.

The National Airspace System (NAS) Systems Engineering and Analysis Division (ACT-500) of the Technical Center selected Princeton Economic Research, Inc. (PERI) to accomplish this study because economic impact assessment skills are not within the Technical Center core capabilities.

To determine the indirect impacts of the Technical Center, it was necessary to use an economic simulation model to calculate all the economic activity of the Technical Center spending and employment generated in the study region. The analysts chose the EDFS-53 model, designed by Regional Economic Models, Inc. (REMI). A description of the model is provided in Section 2 (Methodology). A general discussion of economic models is presented in Appendix A.

1.1 Purpose

PERI conducted this study to determine the economic contributions of the Technical Center to the economy of Southern New Jersey. The study region included the counties of Atlantic, Cape May, Ocean, Cumberland, Burlington, Camden, Gloucester, and Salem. The study quantifies the direct expenditures of the Technical Center and the indirect economic effects of those expenditures. The accounting of direct expenditures included the jobs of all Federal employees at the Technical Center and the money spent within the region on goods and services to support

its operation.[1] The indirect economic effects of the Technical Center result from the money that is re-circulated in the regional economy by its employees and the local businesses that sell goods and services to the Center.

1.2 Background

The Technical Center is the national scientific test base for FAA research, development, and acquisition programs. Technical Center activities involve test and evaluation in ATC, communications, navigation, airports, aircraft safety, and security. Activities involve long-range development of innovative aviation systems and concepts, development of new ATC equipment and software, and in-service modification of existing systems and procedures.

On July 1, 1958, the Airways Modernization Board established the National Aviation Facilities Experimental Center (NAFEC) as the foremost aviation research and development facility. A former naval station, the board selected this facility for its broad range of flying conditions and its proximity to both the northeast high-density corridor and open airspace above the Atlantic Ocean. The Federal Aviation Act of 1958 dissolved the Airways Modernization Board and created the FAA as an independent government agency. NAFEC became the FAA Technical Center on May 29, 1980, concluding with the dedication of the $50 million, 516,000-square foot Technical Building. On May 6, 1996, the Technical Center was renamed the William J. Hughes Technical Center. It continues its commitment to staying on the cutting edge of aviation research and technology as evidenced by the growth and expansion of its research facilities.

At any one time, about 150 projects are underway at the Technical Center, many assigned by FAA Headquarters. Private-industry contractors and, through aviation research grants, academic institutions perform much of this work. Covering 5,059 acres, the Technical Center consists of laboratories, test facilities, support facilities, an airplane hangar, and the Atlantic City International Airport. The Technical Center also has a heating and air conditioning plant, industrial shops, maintenance facilities, and a security department.

Located 10 miles northwest of Atlantic City, the Atlantic City International Airport is currently owned and operated by the FAA. The airport, including two operating runways, is open to private, commercial, and military aircraft. The main instrument runway is 10,000 ft long and 180 ft wide. Several experimental approach and guidance systems are tested at the airport. Plans call for the state to control the airport. Negotiations are underway to transfer control of close to 3,000 acres of airport property, the runways, and related facilities to the state to be controlled by the South Jersey Transportation Authority. The Authority currently owns the airport passenger terminal that is leased and operated by Johnson Controls. The Authority will handle airport operations under a 50-year lease with the FAA. The FAA will continue to use the airport to support Technical Center research programs.

Over 1,500 full-time Federal employees work at the Technical Center in 150 occupational specialties. The Technical Center also conducts an active cooperative education program with

[1] The Atlantic City International Airport is also operated by the FAA and is located in close physical proximity to the Center. However, only the Center's employment and operating expenses were considered in this study.

several academic institutions across the country. The Technical Center youth and summer employment programs stimulate student and community interest in scientific and aviation-related fields.

1.3 Literary Sources

The following list contains sources for further information about this study:

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2. Methodology

Economics analysts used the REMI EDFS-53 model, contractor interviews, and a community involvement survey to provide a comprehensive picture of the impact of the Technical Center on the region. The model provides state-of-the-art methods of accounting for employee and Technical Center spending, estimating the fraction that stays in the local economy, and estimating what fraction of that spending becomes local income and is re-spent in the local economy. Senior staff members conducted interviews with representatives of nine firms with the largest Technical Center contracts to provide validation of the economic data. The staff also

conducted a Technical Center employee and contractor community involvement survey to provide a broader picture of the contributions of Technical Center employees and contractors to the local community.

The study region includes the counties of Atlantic, Cape May, Ocean, Cumberland, Burlington, Camden, Gloucester, and Salem. The Center directly employs 1,573 people, not including its contractor employees.[2] Of the Center employees, 1,423 live within the study region.

The analysis began with the development of a baseline regional forecast for 1997. Then, the data on Technical Center employment and operating expenditures were used to produce a counterfactual experiment. This determined the size and shape of the economy as if the Technical Center had not existed as of 1997.

As the study was being performed, staff members monitoring this study identified additional, non-quantitative information. To provide a broader context for the analytical portions of this study, they conducted interviews with Technical Center contractor representatives and a survey of volunteer activities. The results of these two supplemental efforts are summarized in Appendixes B and C. In Appendix B, the analysts provide the results of interviews that the staff conducted with representatives of the nine largest contractors at the Technical Center. These interviews identified some of the additional contributions that the Technical Center and contractor employees make to the region. In Appendix C, the researchers provide the results of a direct survey of Technical Center employees and contractor employees conducted to develop information on the volunteer activities of these employees. These data provide useful insights into some of the non-quantifiable benefits to the region resulting from the Technical Center.

2.1 Basic Characteristics of the REMI Model[3]

The REMI model is a tool for economic and policy analysis that blends traditional input-output analysis with economic simulation. It allows the investigator to capture the full range of industry effects of a change over time. The model shows the impact as changes on an industry flow to its suppliers and their employees and in turn their suppliers and employees. The economic simulation capabilities accurately capture the broad set of economic responses to any shock to the system, such as the effect on wages and employment in other industries of a negative shock to one industry.

The model antecedents are the Treyz-Friedlaender-Stevens regional model developed for the National Academy of Sciences and the Massachusetts Economic Policy Analysis model developed by Dr. Treyz for the state of Massachusetts. A REMI regional or multi-regional model can be built for any county or aggregation of counties (including states). Essentially, the REMI model predicts, for each year in the future, the level and distribution of employment in the region for each of 53 industry sectors (displayed in Table 1), 94 detailed occupational categories,

2 When the Technical Center awards a contract, it is purchasing a good or service, not directly creating employment. Therefore, all the jobs created by Technical Center contractors are considered an indirect impact.

3 Portions of this section are from "REMI and I-O Models Compared," by Glen Weisbrod.

Table 1. REMI EDFS-53 Model Industrial Sectors

Lumber	Petroleum Products	Wholesale
Furniture	Rubber	Hotels
Stone, Clay Glass	Leather	Personal & Repair Services
Primary Metals	Mining	Private Household Services
Fabricated Metals	Contract Construction	Auto Repair & Services
Non-Electrical Machinery	Railroad	Misc. Business Services
Electrical Equipment	Trucking	Amusement & Recreation
Motor Vehicles	Local/Interurban Transit	Motion Pictures
Rest of Transportation Equipment	Air Transportation	Medical
Instruments	Other Transportation	Misc. Professional Services
Misc. Manufacturing	Communication	Education
Food	Public Utilities	Non-profit Organizations
Tobacco Manufacturing	Banking	Agriculture, Forestry, Fishery
Textiles	Insurance	State & Local Governments
Apparel	Credit & Finance	Federal Government – Civilian
Paper	Real Estate	Federal Government – Military
Printing	Eating & Drinking Establishments	Farm
Chemicals	Rest of Retail Trade	

25 final demand sectors, and 202 age/sex cohorts. The model also predicts other variables such as personal income, population, wage rates, output, and value added for the specified region. Treyz (1993) and Treyz, Rickman, and Shao (1992) outline the detailed structure of the model. Independent evaluations of the REMI model consistently rate it as a high-performance model with a sound theoretical structure, especially for analysis of community economic development (Cassino & Giarratani, 1992).

The REMI model uses an input-output (I-O) structure to detail linkages between industries, but its methodology goes beyond other strictly I-O models. The REMI I-O structure generates intermediate demand for each industry. The proportion of intermediate and final demands for each industry fulfilled by producers in the region is indigenously determined. This proportion is called the Regional Purchase Coefficient. Demand not fulfilled by local production leads to imports into the region. Additionally, export demand for each industry is indigenously determined. It is this internalization of import-competing production and production for exports that most clearly separates the REMI model from other models using similar approaches. This is a crucial difference in approach, which makes regional analysis viable.

In national policy simulations, the importance of the economy's openness is often marginal (i.e., a change in U.S. taxes that can produce only a small effect on the decisions of firms whether to locate in the country). This effect is not of the same order of magnitude of the effect seen by a state or city in the United States making a similarly-sized change in taxes on the decisions of firms to locate locally.

Factors that further differentiate the REMI model from simple I-O models include

a. use of measured regional labor wage rates and total factor productivity for each industry sector rather than national averages;
b. use of measured regional electrical, gas, and oil fuel costs, rather than national averages;
c. use of actual state corporate and average property taxes rather than national averages;
d. use of measured regional capital costs for equipment inventory and structures rather than national averages;
e. use of measured regional production costs and in profitability by industry rather than national averages;
f. use of measured regional labor intensity (i.e., labor input per unit of output) for each industry sector rather than national averages;
g. use of a measured regional occupation mix of the regional labor force and demand for each occupation category rather than national averages; and
h. use of measured regional residential and non-residential investment rather than national averages.

The model is calibrated through a data set that includes a history of employment by industry sector from 1969 to the present. The model also uses national forecasts of future growth or decline by industry sector produced by the U.S. Bureau of Labor Statistics. Historical data are used to track how the industrial mix and concentration of employment in the region is different from the rest of the country and how the economic growth trends in the region differ from national trends for each industry sector. This makes it possible to estimate the extent to which each industrial sector in the region has employment dependent on serving other industries within the region and employment dependent on exports of goods and services to the rest of the nation. This is determined historically and then forecast into the future.

An essential difference between pure I-O analysis and the REMI EDFS-53 model is that the I-O systems are static analysis tools, whereas the REMI model is dynamic. I-O analysis is not usually applicable for economic simulation. It is not designed to simulate effects of factors that change the relative costs and competitive position of businesses in an area, as can occur from changes in occupational wage rates, population and labor force participation rates, energy and transportation costs, and costs of capital. Determining these factors requires a more sophisticated simulation model such as EDFS-53.

The REMI model, unlike simple I-O models, can be used for both long- and short-term analysis. It is able to simulate how long-term impacts may differ from short-term impacts due to induced changes in competition for labor (wage rates), population in/out migration rates, labor/capital

substitution, and inflation. The REMI model estimates the future economic profile of a region based on national forecasts of industry growth, changing technology, and its own estimates of the shifting competitive position of each industry in a given region compared to that industry elsewhere in the country. The model uses I-O analysis techniques, the best means of estimating the extent of inter-industry interactions, thereby measuring the multiplier effects on the local economy. The degree to which demand changes in the local economy are distributed elsewhere rather than mainly affecting the local economy is dependent on the trade-intensity of the affected industrial sectors. That is, if the effects of the Technical Center fall on the construction or repair industries (inherently local), then that is far different from effects on the computer industry (essentially global).

The REMI EDFS-53 model is best for this study for several other reasons. The EDFS-53 model can be applied at the level of a single county or multi-county region. By restricting the study region to the counties immediately surrounding the Technical Center, the analysts obtained a more accurate measure of its impact. The model also can measure effects on local, state, and federal expenditures. This increases the accuracy of the measures because the effects of government spending are the crucial parameters. The model uses a time-series of data to account for regional trends. It employs a quasi-equilibrium modeling approach, which permits the effects of the location preferences of both industries and households to enter the model dynamically. Rather than relying on external estimates, the model endogenously determines the extent of migration and industry relocation based on relative wage rates and other costs of doing business. In simpler terms, the model takes neither of the extreme views of the economy sometimes espoused. It neither forces immediate equilibrium with no individuals being involuntarily unemployed nor ignores the natural forces that eventually move the economy toward equilibrium.

In summary, the analysts selected the EDFS-53 model because they believe that it is the best choice for analyzing the impacts of the Technical Center on the Southern New Jersey economy. It is better equipped than simple regional I-O models to estimate the total probable effects of a major economic driver.

2.2 Major Economic Assumptions

The analysts used the standard set of assumptions to operate the REMI model, except when conducting counterfactual assessments of the Technical Center benefits. This is done to guarantee that the simulation exercise does not have results influenced by the analyst's forecasting decisions and, therefore, not replicable by others. Specifically, the EDFS-53 model is preprogrammed by REMI with data on the economy of the study region and basic assumptions about macroeconomic factors such as current levels of employment and economic output. The data are based on historical information collected from a variety of sources including the U.S. Department of Labor and the Department of Commerce. The major assumptions are shown in Table 2.

Table 2. Major Economic Assumptions in the EDFS-53 Model

	1995	1996	1997
Total Employment (Millions)	1.020	1.029	1.039
Population (Millions)	2.154	2.174	2.193
Real Gross Regional Product (Billions of 1992 Dollars)	53.111	55.188	57.457
Personal Income (Billions of Dollars)	53.556	56.255	58.895
Disposable Income (Billions of Dollars)	45.409	47.569	49.825
Producer Price Index (1992 = 100)	112.625	115.002	117.563
Real Disposable Income (Billions of Dollars)	40.319	41.363	42.381
Real Disposable Income per Capita (Billions of Dollars)	18.714	19.027	19.325

2.3 Running the Model

The process for conducting an analysis is illustrated by the following steps, which are shown in Figure 1:

a. Formulate the policy question and determine that the model is structurally capable of performing the experiment. For this study, the policy question is "What is the economic impact of the William J. Hughes Technical Center on the economy of Southern New Jersey?"

b. Run the model using the REMI baseline economic assumptions. This produces a control forecast that serves as the baseline for measuring the changes to the economy.

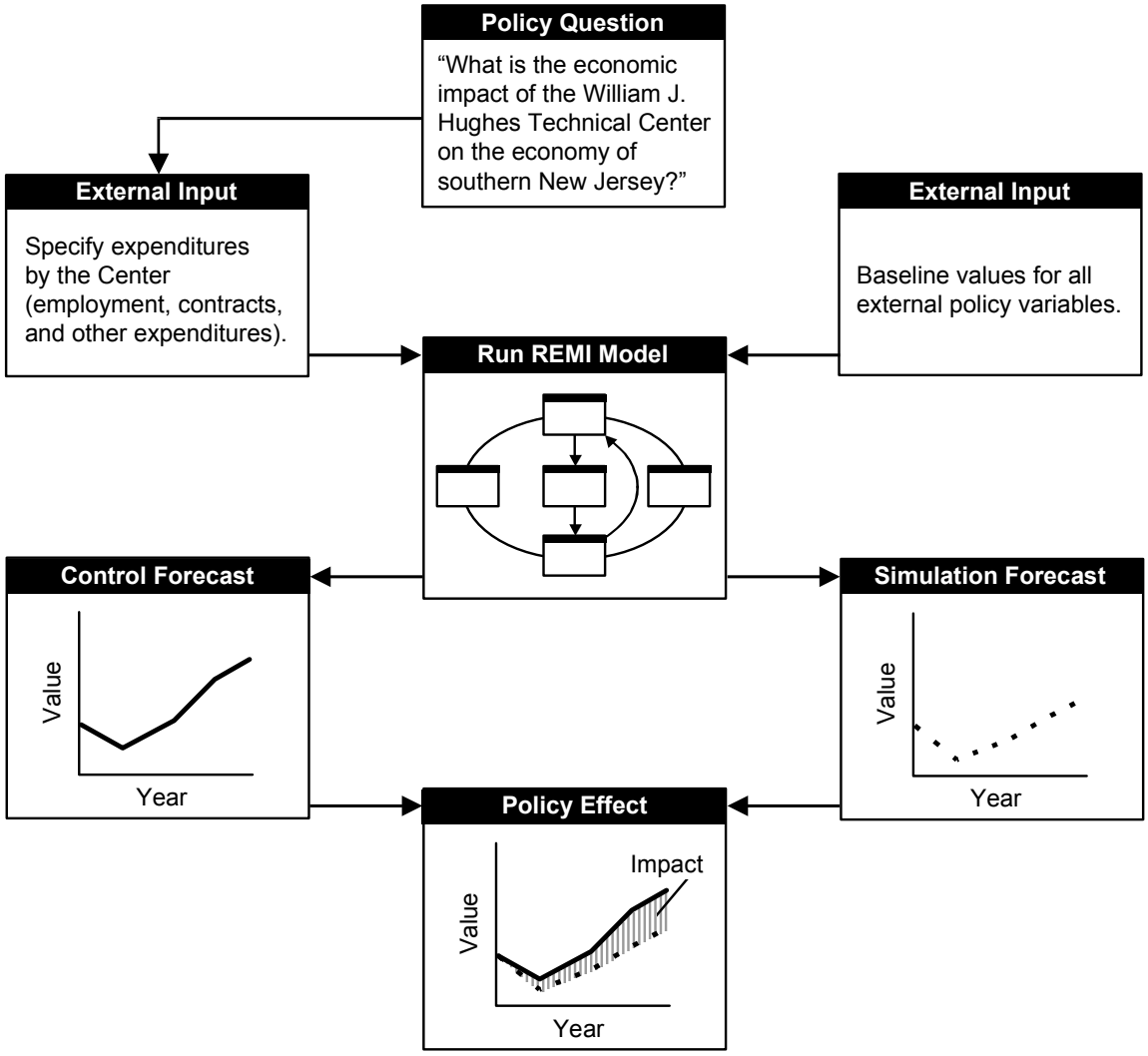
    1. Determine the expenditures of the Technical Center from available data and put them into the model by setting (or add-factoring) the appropriate subset of the 1516 policy variables available in the EDFS-53 model.

    2. Rerun the model, creating a complete, alternative simulation forecast based on the policy variable changes that have been specified.

    3. Examine the model output to determine the difference between the control and the simulation forecasts to estimate the total economic impact of the Technical Center.

Because the EDFS-53 model includes the current basic economic data on the study region, the benefits calculation is performed by subtracting the Technical Center presence. The difference in projections for population, employment, personal income, and output between the alternate and control forecasts represents the total economic impact of the Technical Center.

The Technical Center expenditures are described in Section 3. In Section 4, the researchers discuss the simulation exercises that calculate total regional effects.



Source: Regional Economic Models

Figure 1. REMI Model flow chart.

3. Technical Center Operating Expenditures

This study examined two major categories of expenditures made by the Technical Center: operating expenditures and employment. To accurately measure the impact of the Technical Center on the study region, the researchers determined not only what goods and services the Center purchases but also what portion of those are purchased from firms within the region. Additionally, the researchers determined the number of Technical Center employees living within the region and the total of their salaries.

3.1 Operating Expenditures

There are two subcategories of operating expenditures: awards for large contracts (generally those over $25,000 in value) and small purchases (under $25,000). To fulfill federal government reporting requirements, the Technical Center Contracts Section has a detailed database on large contract awards. This database includes the contractor's standard industrial classification (SIC) code and its location. Based on this information plus information obtained from whose contracts were awarded from headquarters in Washington, DC, analysts were able to determine the total dollar amount of awards made in each industrial sector and how much was spent within the region. The details of large contract awards are shown in Table 3.

Table 3. Large Contract Awards by SIC Code

SIC CODE	DESCRIPTION	ALL AWARDS	IN-REGION AWARDS
15	Building construction -- general contractors and operative builders	$2,877,049	$2,877,049
16	Heavy construction other than building construction -- contractors	$2,272,479	$2,272,479
17	Construction -- special trade contractors	$3,313,856	$3,313,856
22	Textile mill products	$2,328	$216
29	Petroleum refining and related industries	($7,961)	$0
34	Fabricated metal products, except machinery and transportation equipment	$42,557	$42,557
35	Industrial and commercial machinery and computer equipment	$7,757,688	$1,665,274
36	Electronic and other electrical equipment and components, except computer equipment	$1,294,411	$150,191
38	Measuring, analyzing, and controlling instruments	$6,935,414	$3,923,506
48	Communications	$135,644	$12,561
50	Wholesale trade -- durable goods	$213,772	$19,796
73	Business Services	$76,334,035	$69,407,325
76	Miscellaneous repair services	$154,515	$0
82	Educational services	($3,078)	$0
83	Social services	$365,580	$0
87	Engineering, accounting, research, management, and related services	$54,883,409	$41,299,698
89	Miscellaneous services	$4,427,551	$4,268,514
	TOTAL	$160,999,249	$129,252,285

The two largest expenditure groups are SIC Codes 73, Business Services and 87, Engineering, accounting, research, management, and related services. These two groups total $131,217,444. This amount is particularly significant because the nature of service contracts is that the work is performed locally, and the bulk of the money is paid to local employees. Consequently, the bulk of that money remains in the local economy where it continues to circulate.

Purchases under $25,000 include purchases using delivery orders, purchase orders, and credit cards. The Technical Center Contracts Section does not have a database on purchases under $25,000 similar to the one for large contract awards. However, it does maintain extensive logbooks detailing the items purchased using these small procurement mechanisms. Because the logbooks contain thousands of entries, a representative sample was used to estimate the amount spent within each industrial category.[4]

There was sufficient information in the logbooks to determine the appropriate SIC code for small purchases, however, there were not sufficient data to determine if the purchases were made inside or outside the study region. Therefore, researchers assumed that the percentage of small purchases made in-region would be the same for each standard industrial category as for large purchases. Where there was no corresponding industrial category under large purchases, researchers used the average (71%) for the determination of in-region purchases. The analysts believe the assumptions for small purchases are reasonable estimates. The details of small purchases are shown in Table 4.

The EDFS-53 model uses a classification of industrial sectors that is similar to, but not exactly the same as, the two-digit SIC code system. Whereas the two-digit SIC code system divides all business activity into 83 different industrial sectors, the REMI EDFS-53 model uses only 53 sectors to represent the regional economy. For example, there are three 2-digit SIC codes used to represent various types of construction (i.e., building construction, heavy construction, and special trades), while EDFS-53 combines all three into a single sector that covers all construction activities. The details of how all operating expenditures (large awards and small purchases) were categorized into EDFS-53 model industrial sectors are shown in Table 5.

4 The sample size was 149 purchases totaling $816,252. The sample size equals about 3 percent of total small purchase spending.

Table 4. Small Purchases by SIC Code

SIC CODE	DESCRIPTION	ALL PURCHASES	IN-REGION PURCHASES
15, 16, 17	Construction	$599,231	$599,231
25	Furniture and fixtures	$1,628,038	$1,152,549
26	Paper and allied products	$142,046	$100,559
29	Petroleum refining and related industries	$237,024	$0
35	Industrial and commercial machinery and computer equipment	$4,002,093	$538,340
36	Electronic components, except computer equipment	$4,113,650	$106,208
37	Transportation equipment	$65,165	$46,133
38	Measuring, analyzing, and controlling instruments	$1,249,238	$651,354
45	Air Transportation	$82,722	$58,562
48	Communications	$798,521	$0
50	Wholesale trade -- durable goods	$420,701	$0
52	Building materials, hardware	$243,878	$172,651
57	Home furniture, furnishings, and equipment stores	$3,610,159	$2,555,768
59	Miscellaneous retail	$4,328,727	$3,064,469
73	Business services	$5,031,797	$3,708,270
82	Educational services	$1,487,444	$1,053,017
93	Public finance, taxation, and monetary policy [1]	$118,816	$0
	TOTAL	$28,159,250	$13,807,111

[1] This category includes the purchase of reports from National Technical Information Service (NTIS), an agency of the Federal government. This spending was considered to be outside the region.

Table 5. All Operating Expenditures by EDFS-53 Model Industrial Sector

EDFS-53 Model Industrial Sector (Corresponding SIC codes)	ALL AWARDS	IN-REGION AWARDS
Construction (15, 16, 17)	$9,062,615	$9,062,615
Textiles (22)	$2,328	$0
Furniture (25)	$1,628,038	$1,152,549
Paper (26)	$142,046	$100,559
Petroleum Products (29)	$229,063	$0
Fabricated metal products (34)	$42,557	$42,557
Machines and Computers (35)	$11,759,781	$2,203,614
Electronic equipment (36)	$5,408,061	$256,399
Transportation Equipment - Non-Automotive (part of 37)	$65,165	$46,133
Instruments (38)	$8,184,652	$4,574,860
Air Transportation (45)	$82,722	$58,562
Communications (48)	$934,165	$12,561
Wholesale (50, 51)	$634,473	$19,796
Rest of Retail Trade (52-57, 59)	$8,182,764	$5,792,888
Misc. Business Services (73)	$81,365,832	$73,115,595
Personal Services/Repairs (72, 76)	$154,515	$0
Education (82)	$1,484,366	$1,053,017
Non-profit (83, 84, 86)	$365,580	$0
Misc. Professional Services (81, 87, 89)	$59,310,960	$45,568,212
Public finance, taxation, and monetary policy (93)	$118,816	$0
TOTAL	$189,158,499	$143,059,396

3.2 Employment

The Technical Center employs 1,573 people. Based on the home zip codes reported in the Technical Center personnel database, 1,354 (or 86%) of the employees have permanent residences within the eight-county study region. Seven employees (less than 1%) live in other parts of New Jersey, and 216 (14%) have permanent residences outside of New Jersey.

Of the 216 employees who have permanent residences outside of New Jersey, 68 live in neighboring states and commute to the Technical Center to work. Another 11 employees are students with paid internships at the Technical Center. Finally, 137 of the out-of-state employees are Air Traffic Control Specialists (ATCSs) on temporary assignment to the

Technical Center. To account for the portion of their income spent outside the region (e.g., money sent to their families in their home states), researchers assumed that their in-region spending equals half of their annual salary. To reflect this in the model, analysts added an additional 69 employees (half of the 137 ATCSs) to the 1,354 in-region employees for a total of 1,423. Considering that the visiting ATCSs receive a per-diem allowance in addition to their regular salary, analysts believe this approximation of their in-region spending is a conservative estimate. Table 6 shows the data on employees including their geographic distribution.

Table 6. Technical Center Employment by Region

County	Employees	Percentage of Total Employees
Atlantic	917	58%
Burlington	56	4%
Camden	124	8%
Cape May	98	6%
Cumberland	44	3%
Gloucester	46	3%
Ocean	68	4%
Salem	1	Under 1%
In-Region Subtotal	1,354	86%
Other New Jersey Counties	7	Under 1%
Out-of-State Employees	216	14%
Air Traffic Control Specialists (subset of Out-of-State Employees)	137	9%
Total Employees	1,573	100%
Employees Counted as In-Region [1]	1,423	90%

[1] We assumed that in-region spending for ATCSs amounts to 50% of their annual salary. To reflect this in the model, we increased the number of in-region employees by 69 (1/2 of 137) for a total of 1,423.

4. Creating a Simulation

The analyst used the REMI EDFS-53 model to estimate the total economic contribution of the Technical Center to Southern New Jersey. Researchers compared a control forecast of the regional economy to one that effected a change in the economy based on the counterfactual analysis of a situation without the economic value added by the Technical Center. This analysis captures the effects of Technical Center and contractor employment and purchases and the multiple rounds of economic stimulus produced as these incomes are spent, received, and re-spent by the recipients. The difference is the Technical Center's total economic impact upon Southern New Jersey.

The REMI model bases its control forecast on the most recent available estimates of local economic activity for 53 detailed industries extrapolated forward in time by their national economic trends through 1997. In this study-control forecast, therefore, Technical Center-related spending, employment, and payroll are assumed unchanged from their 1997 levels. The results of the REMI control forecast for Southern New Jersey are available in supporting data and will be furnished upon request from Dennis Steelman, ACT-504.

The analyst's main task, at this point, was to simulate the total economic effect of the Technical Center including its contractors and suppliers. In the REMI model, the Technical Center is a portion of the Southern New Jersey civilian federal government sector. To do this, researchers first adjusted the REMI-provided information on this sector to reflect a change of the magnitude of Technical Center-related economic activities. Then, they changed federal civilian employment by 1,423 workers, and the REMI-provided regional federal payroll by a factor to reflect these workers who earn more than the average federal earnings.

By virtue of the Technical Center research and development activities, its employees tend to be scientists, engineers, and other degreed technical professionals with post-graduate degrees. Its workforce, therefore, is not representative of the remainder of the regional federal civilian sector, which mostly supports military bases. Indeed, due to the nature of aviation research and development that requires specialized education and skills, Technical Center employees in 1997 were significantly different in most respects from the average government employee in the region. These differences in education, spending, and salary patterns were taken into account in the simulation exercise.

The analyst also altered the model parameters to account for the $143 million in business with contractors and suppliers shown in Table 5. The analyst entered data only on the in-region awards. This enabled the model to estimate indirect economic effects and allowed researchers to apply known data for Technical Center spending.

5. Simulation Results

The results of the simulation of the Southern New Jersey economy without the Technical Center's economic contribution are shown in Table 7. The difference between the simulation and the REMI control forecast for Southern New Jersey is also shown in Table 7. Supporting data are available upon request from Dennis Steelman, ACT-504.

Table 7. Technical Center Impacts

	Control	Simulation	Approximate Impact
Total employment	1,039,361	1,033,474	5,900
Gross Regional Product (Billions of Dollars)	57.457	57.178	0.28
Personal income (Billions of Dollars)	58.895	58.680	0.21
Disposable income (Billions of Dollars)	49.825	49.652	0.17
Real disposable income (Billions of Dollars)	42.381	42.255	0.13
Population	2,193,065	2,191,891	1,200

5.1 Short-Term Contribution to Job Creation, Incomes, and Regional Product

As shown in Table 6, the Technical Center's 1,423 local jobs represent only a portion of the total employment in the study region resulting from the Technical Center. Approximately 4,500 additional jobs in Southern New Jersey can be attributed to the Technical Center. This means that for every federal job at the Technical Center, three more jobs are created by other organizations in Southern New Jersey due to the Center. This high multiplier effect of Technical Center activities is in part a function of its status as project manager of various subcontracts. Given that the Technical Center total budget in 1996 was $370 million, on average, each employee was responsible for output 3.9 times their average annual wage.

The analysts estimated the impact on the region's employment beyond the direct workforce of the Technical Center to be approximately 4500 additional regional jobs. This figure includes contract employees of the Technical Center plus the jobs that are created by circulation of Technical Center spending throughout the region's economy. The total payroll of the Center is $94.5 million, of which $85.5 million is earned by employees who live within the region. They estimated the contribution to the gross regional product, the dollar value of all goods and services produced within the region, to be nearly $280 million. This figure includes the salaries of both Technical Center and contract employees working for the Center. It also includes the salaries of other residents, from store clerks, to educators, to local government employees, whose livelihoods are based on the demand created by the presence of the Technical Center and the purchases of its employees and contractors.

An additional factor contributing to the multiplier effect is the nature of the Technical Center's contract purchases and the characteristics of the Center employees. It is a unique institution due to the sophistication of its employees and contractors. Any government spending impacts the local economy through local goods and services purchased and impacts global economy through goods and services purchased from outside the area. The multipliers found in regional models are typically much smaller than multipliers estimated for a nation as a whole because many of the goods and services purchased make up the indirect effects (imports) to a specific region. In this case, the purchases made by the Technical Center are nearly all services that are purchased in the local economy. Similarly, the employees consume more educational and other local services than the average resident due to their employment as technology and knowledge workers. In economic terms, the Technical Center has a uniquely positive multiplier effect on the size and quality of the local economy compared to the general government operation, which has a more global impact.

5.2 Long-Term Contribution to Job Creation, Incomes, and Regional Product

In addition to quantifying the short-term effects of the Technical Center on the local economy, it is crucial to assess the permanence of the impacts. In a closed system (such as a national economy with little international trade), the effects of a facility like the Technical Center would be diminished by the passage of time as markets adjust and equilibrium is reestablished. In the long run, then, approximately the same number of people would be employed in similar jobs making about the same income and spending about the same amount, regardless of any particular project or facility.

A region such as Southern New Jersey is far from a closed system and is actually competing with other regions. To evaluate how permanent the effects of the Technical Center are on the regional economy, the researchers conducted a further set of simulation exercises using the REMI Model.

Over a 10-year period, the Technical Center regionally generates between 50,000 to 60,000 more person years, and the gross regional product and personal incomes are each about $3,000,000,000 dollars higher. The Southern New Jersey region is more prosperous with more high-quality jobs and a larger inflow of population because of the Technical Center. Table 8 shows the results of a 10-year analysis.

Table 8. Technical Center Total Impacts Over Ten Years

	Approximate Impact
Total Employment (person years)	50,000-60,000
Gross Regional Product (Billions of Dollars)	3.0
Personal Income (Billions of Dollars)	2.9

The following paragraphs present the results of the two complementary activities, interviews with Technical Center contractors and a community involvement survey, which were conducted in conjunction with the economic impact determination. These activities are intended to provide validation of the economic data and a broader picture of the contributions of Technical Center employees and contractors to the local community.

5.3 Interviews with Technical Center Contractor Representatives

Senior staff members conducted personal interviews with executive representatives of the nine largest contractors in April 1997. The interviews covered such topics as employment and payroll, local purchases, labor market concerns, and their impressions of the Technical Center contributions. Data derived from these interviews are provided in Appendix B.

5.3.1 Employment and Payrolls

These nine firms have 1,038 employees and account for over $51 million in employee payrolls within the eight-county area in 1996. Almost all the employees (97%) live in the eight-county Southern New Jersey area. These firms also have 53 subcontracts with other firms, mostly in the Southern New Jersey area, involving 415 employees.

5.3.2 Local Purchases

Aside from labor, their largest annual local expenditure in 1996 was for office space. Eight of the nine firms lease office space near the Technical Center, accounting for approximately 140,000 square feet of commercial real estate. Other major components of local purchases include office supplies, travel-related services, and (for three firms in 1996) computer equipment for a total of $5.4 million.

5.3.3 Labor Market Concerns

The contractors report difficulty in recruiting staff at all levels, from entry through senior positions. They say that the Technical Center is the "only high tech game in town" and they would like to see more diversification of high technology industries in the area. They are aware of and interested in plans to promote other high technology industries and to develop stronger relations with educational institutions throughout New Jersey and in neighboring states.

5.3.4 Highlighting Technical Center Contributions

The contractors view the most important contributions of the Technical Center as

- evaluation, testing, and support of air traffic control systems; and
- research related to aircraft, facility, and passenger safety.

They also mention the impact that the Technical Center has on the local economy, on educational institutions, and on the community. Many had ideas for publicizing and promoting the work and achievements of the Technical Center, which one contractor described as "a high-tech national treasure with unique capabilities."

5.4 Community Involvement Survey Results

The researchers conducted the Technical Center and contractor employee community involvement survey in April and May of 1997. It is based on 588 returns and a response rate of 23%. The survey has an overall margin of sampling error of ±4.1 percentage points. Data compiled about community involvement are provided in Appendix C. Among households with a member working at the Technical Center or a contractor, 78% had one or more adults who were involved in volunteer activities in the local community in 1996. The overall cumulative contribution in full-time year-round workers was equivalent to 142 full-time workers. At $13.23 per hour (an average U.S. wage used in national surveys to measure the value of volunteer efforts), the volunteers contributed the equivalent of $3.7 million to the surrounding communities in donated time.

6. Summary of Effects

In summary, there are positive impacts, both quantitative and qualitative, from the Technical Center presence in Southern New Jersey. Table 9 shows the annual expenditures that flow into the local economy. The effects are larger than would be estimated by counting employees and their incomes or including the contractors that perform vital Technical Center functions. The spending and re-spending of dollars in the economy establishes a multiplier effect that significantly increases the impact of the Technical Center on the economy. Table 10 shows the results of the multiplier effects estimated by the REMI model. Furthermore, contractors increase the multiplier beyond what would normally be the effect of a government operation. The Technical Center employees and contractors spend more personal resources on services produced locally, which strengthens the local educational and construction sectors, to name only two. Finally, there are positive impacts of having a scientific and technical research facility in the region that can't be quantified.

Appendix D, which is available only on the CD-Rom for this document, contains the raw data for the survey.

Table 9. South Jersey Regional Expenditures

	Total	In-Region
Annual Expenditures	$189,158,499	$143,059,396
Technical Center Employees	1,573	1,423

Table 10. South Jersey Regional Impact

	Annual Impact	10 Year Impact (Approximate estimate)
Gross Regional Product	$280,000,000	$3.0 B
Regional Employees	5,900	50,000-60,000

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Appendix A:

Discussion of Economic Models

A1 Comparison of Models

Generally speaking, there are two types of models: macroeconometric models, based on the work of Lawrence Klein and input-output (I-O) models, based on the work of Wassily Leontief. Most large, complex macroeconomic models are a combination of both of these approaches, but are primarily one or the other. The Regional Economic Models, Inc. (REMI) model used in this study is primarily an I-O model but also incorporates macroeconometric model features. It is generally considered the premier regional input-output model available in the U.S.

A1.1 Macroeconomic Models

Macroeconomic models are simplified representations of the real world and are constructed using a set of assumptions about the economy. Model builders postulate, test, and estimate structural relationships among economic variables such as disposable income and consumption that are used to forecast the effects of some event. Complex models containing many equations representing relationships between economic variables have been developed and are currently available for many different uses. Because of the interrelated nature of the economic variables, a change in one variable ordinarily affects many others. An exogenous increase in wages, for instance, can affect prices, income, and employment, with second round effects on consumer spending, and industry output.

A1.2 Econometric Models

Econometric models are systems of simultaneous equations based on economic principles and quantitatively specified using statistical techniques. The models use a large amount of empirical data to specify economic relationships among variables that are, in turn, used to evaluate different policies. Most large commercial models begin with an overall Keynesian framework to describe relationships between income, consumption, investment, and other economic variables. However, most models today end up being a synthesis. For instance, the widely used Data Resources, Inc. (DRI) model also incorporates major elements of the neoclassical, monetarist, and rational expectations views.

There are three main reasons why a macroeconometric model would not have been optimal for this study. First, econometric models tend to be highly aggregated and do not provide estimates of industrial sector output levels. Even though some of the econometric models such as the DRI and Wharton (WEFA) models are more desegregated than others and have an I-O element within the model, they are still top-down models instead of being a bottom-up model like I-O models. This means that industry forecasts tend to be given secondary treatment with results flowing from the aggregate model. Second, econometric models generally can not simulate regional nuances, which are critical for analyzing policy issues in a relatively small area, such as Southern New Jersey. Third, econometric models tend to place a strong reliance on historical patterns of effect that can limit the model flexibility in dealing with a structural change such as

the presence of the Technical Center. Instead of dealing with structural change, they are designed to successfully forecast the impact of policy, price, and other shocks that have predictable effects based on historical experience.

A1.3 Input-Output Models

I-O models emphasize the interdependence of the economy and the fact that each industry uses the output of other industries as inputs to its own production. In turn it supplies output to be used as input to other industries' products. I-O analysis is used to determine the amount each industry must produce to obtain a specified level of final goods. Both direct and indirect effects can be measured. It assumes that inputs are used in fixed or predictable proportions to produce any product and that there are constant returns to scale. For example, every ton of steel produced requires a certain amount of labor, iron ore, coke, fuel, and so on. At the same time, the incorporation of economic effects in a simple I-O model can allow for saving on some inputs such as labor or energy as their costs rise. The purchase of the labor and raw materials constitutes the direct effect of steel production on the economy. In turn, the workers and material suppliers purchase goods and services from other industries, which in turn purchase from other industries, and so on, until the effect of the final demand has been traced to its last reverberations in the furthest corner of the economy. These additional layers constitute the indirect effects on the economy.

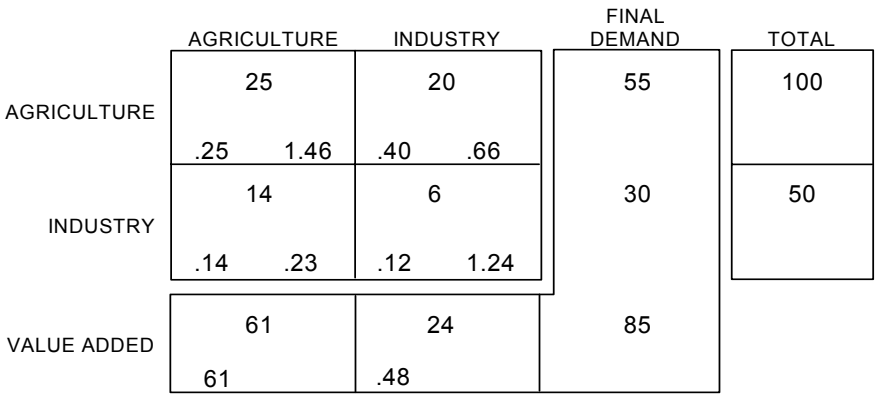
Inter-industry relationships are depicted in an I-O table that is a matrix of the various industries in the economy. The horizontal rows indicate how the output of each sector of the economy is distributed among the others. Conversely, the vertical columns show how each sector obtains its needed inputs of goods and services from the others.

Figure A1 depicts a hypothetical economy broken down into two sectors -- agriculture and industry. Reading across the row for one of these sectors, the top numbers in each cell show:

- the distribution of the sector output of intermediate products to itself and to the other sectors within the inter-industry matrix and its
- delivered finished products to final demand.

When reading down a column, these same figures show the input of intermediate products required by the sector plus its value added (i.e., its inputs of labor, depreciation, and profit).

- the final demand and value added for the system as a whole sum to the same gross national product
- the lower left figures in each cell are the I-O coefficients and express the ratio of the input shown to the total output of the sector in whose column it appears
- the lower right hand figures are inverse coefficients that relate the direct and indirect requirement for the input per dollar of delivery to final demand



SOURCE: A.P. CARTER, "THE ECONOMICS OF TECHNOLOGY CHANGE," SCIENTIFIC AMERICAN, VOL. 214, NO. 4, APRIL 1966.

Figure A1: Hypothetical Economy Input-Output Table Consisting of Two Sectors

It should be noted that every single entry in an I-O table is dependent upon every other. A matrix of coefficients for the entire economy gives a quantitatively determined picture of the internal structure of the economic system. This makes it possible to calculate in detail the consequences resulting from changes to the system introduced by the theoretical or practical issues being analyzed.

Most sophisticated models that are primarily I-O models also have some regression-based econometric components so that they imitate as closely as possible the way the economy behaves. The models are clearly bottom-up models that are dynamic in the sense that they show business cycles and may never at any moment be in an equilibrium position. In general, I-O models are superior to econometric models for analysis of structural policy change, because industry level exogenous variables can be easily manipulated. On the other hand, econometric models (e.g., WEFA, DRI) are superior to I-O models for long-term forecasting and macroeconomic policy analysis at an aggregate level. There are two preeminent primarily I-O models: (1) the INFORUM model, and (2) the Regional Economic Models, Inc.'s (REMI) EDFS model.

A1.4 Inforum Model

The Inter-industry Forecasting at the University of Maryland, INFORUM, system of models was founded in 1967 by Clopper Almon, one of the national leading experts in I-O modeling. INFORUM is a group of international I-O models that can be linked. The U.S. INFORUM model has an advantage over the REMI model in that it is more desegregated; the model uses 78 producing sectors, whereas the REMI model only has 53 sectors (see McCarthy (1991) for a detailed description of the U.S. INFORUM model). The primary purpose of the INFORUM model is for national and international policy analyses. The smallest region that can be analyzed is at the state level, whereas the REMI model can be used at the county level. Therefore, it could not be used for this study of the relatively small region, such as Southern New Jersey.

A2 Comparison of Similar Studies

Several economic impact studies were reviewed to insure consistency and compatibility with other researchers' efforts and learn of some of the pitfalls they discovered. The following studies were most relevant to our study and will be briefly reviewed:

1. Economic Impact of Goddard Space Flight Center in Maryland
2. The Economic Impact of Two Proposed Casino Resorts on the State of New Jersey
3. Groton-New London Submarine Base Closing: An Economic Impact Study
4. Airport Economic Studies

Each of these studies has some similarities with our study and offers some useful insights.

A2.1 Economic Impact of Goddard Space Flight Center in Maryland

This study estimated the economic and fiscal impacts of the Goddard Space Flight Center on the state of Maryland. It was conducted by the Maryland Department of Economic and Employment Development using the Maryland Economic Impact Model, which was derived from the U.S. Forest Service IMPLAN system. The results of the study determined that the direct economic effects of the Goddard Center on Maryland amounted to $1,075 million in total expenditures. The direct economic effects were divided into two categories: on-site operations and contractual obligations. On-site operations included salary and fringe benefits of employees residing in Maryland, air transportation, utility, and other small purchases in Maryland (contracts less than $25,000). These operations directly accounted for more than 4000 full-time equivalent jobs and $222 million in output. Contractual obligations included contracts awarded to over 450 Maryland companies and institutions and directly accounted for $853 million in output. The indirect effects, using a standard I-O model, were approximately equal to the direct effects. Thus, the total economic impact of the Center on the state of Maryland was $2.1 billion in gross output or sales, $904 million in employee income, and 26,690 full-time equivalent jobs within Maryland. Contractual obligations accounted for 83% of total expenditures, 73 % of total employee income and 77% of full-time equivalent jobs. The fiscal impact of Goddard on state government revenues, which included annual state retail sales tax and personal income tax receipts from direct and indirect activity, totaled $62.4 million.

Rather than analyzing a particular county or group of counties, the study used the state of Maryland as the unit of analysis. The study concluded that 57% of the direct economic effects of Goddard are outside Maryland, which are not accounted for in the simulation. Determining whether the indirect effects were in or out of the state was problematic. This study illustrates some of the problems of determining the economic impact of a facility where a large and difficult-to-measure proportion of the direct and indirect effects occurs outside the study area.

The researchers did not describe the specific techniques they used to come up with their results. For example, they did not specify whether they simulated the addition of a second facility or the closing of the present facility. It appears they simply used industry multipliers, disregarding other more complex and dynamic effects, such as labor migration. A strength of the study is the

high degree of industry desegregation used -- they analyzed the impact at all 461 industries at the 4-digit SIC code level of detail.

A2.2 The Economic Impact of Two Proposed Casino Resorts on the State of New Jersey

This study, which was conducted in March 1996 by the WEFA Group, estimated the economic impact of two proposed casinos by Mirage Resorts, Inc. and an unidentified partner on the state of New Jersey. The study forecast changes to the economy for a 5-year period. Most of the impact of the casinos is the potential increase in demand for casino visitation in Atlantic City, NJ. Thus, a key issue for this study, but obviously not an issue for our study, is determining an appropriate method of estimating market demand for hypothetical new facilities. The study also considered the economic impact due to construction activity and employment and revenues at the casinos, hotels and restaurants.

The results of the study indicate that the construction activity produces 5,800 jobs and $230 million in wages. The casino operations are expected to attract 9.6 million visitors a year to Atlantic City, and they will spend more than $1.0 billion gambling. The total direct and indirect employment in New Jersey will increase by 20,364 jobs, and their annual wages will be $489 million. Annual state and local tax revenues will increase $197 million.

A weakness of the study is that it is modeling the impacts on the state of New Jersey, but the direct and indirect activity is concentrated in the Atlantic City region. For example, it is suggested that the 20,364 new jobs will decrease the state unemployment by 0.03 of a percentage point. This is probably a misleading indicator of the local effect because high unemployment in Trenton, Newark, and other northern New Jersey cities will probably be unaffected. On the other hand, the increased employment will, at least partially, be accounted for by migration from other states. The WEFA model does not account for labor migration.

A2.3 Groton-New London Submarine Base Closing: An Economic Impact Study

Researchers at the University of Connecticut conducted this study in March 1993, using REMI's EDFS-53 model. They simulated a gradual shutdown of the base over a 5-year period from 1995-2000. The study also modeled different scenarios for the closing (i.e., a complete base shutdown verses the transfer of the Naval Training Center from Orlando, Florida). This type of scenario analysis is helpful in determining the sensitivity of results and the relative impact of different actions. A strength of this study, which was not effectively simulated in any of the other studies we reviewed, was that they used the REMI model to effectively simulate population migration after the base closing. In other words, after the closing of the base, instead of having greater than 25% unemployment in the local area, the model projected a percentage of these newly-unemployed individuals moving to other areas. This type of dynamic modeling makes the projections more realistic.

The overall results of this study were that, by the year 2000, the base closing would result in 8,414 fewer jobs due to direct and indirect effects, a decrease of real gross state product of $125

million and 14,762 people leaving the state (includes other family members). This was the worst-case scenario analysis; other scenarios yielded less dramatic results.

A2.4 Airport Economic Studies

While this study does not include an assessment of the impact of the Atlantic City International Airport, we did examine studies of other airports as part of a general review of economic impact studies. We reviewed studies of four airports: Vancouver International Airport, Dallas/Ft. Worth Regional Airport, Los Angeles International Airport, and Port of Portland Aviation Facilities. We also reviewed an FAA report entitled "Measuring the Regional Economic Significance of Airports" (DOT/FAA/PP/87-1), which examines the issues involved in this type of study.

Despite some similarities to our study, there are also some major differences. The most challenging issue for an airport impact study is the estimation of the economic effects of an improved transportation system. These studies attempt to determine how productivity will change in different industries due to the proximity of an airport. Less emphasis is placed on the economic impact of airport employees, construction of facilities, and so on. All of the airport economic impact studies reviewed used simple I-O multiplier coefficients in determining the indirect/induced effects of the airport. None of the studies used more sophisticated economic models such as REMI. The probable reason for this is that it would have been difficult and expensive to attempt to simulate all of the changes due to a change in transportation infrastructure. For example, the FAA report points out that a problem of examining the impacts of an existing airport is constructing a scenario in which an airport does not exist. To construct this alternate scenario, you then must assume what alternative types of transportation would have evolved in the absence of the airport.

In general, the airport studies tackle a different set of issues than are covered in this study. However, a review of these studies did provide some useful background and suggestions. For instance, most airport economic impact studies used detailed surveys to estimate impacts. However, surveys were not used to test assumptions but, instead, to gather raw data. This was particularly important for these types of studies in determining how air travel affects productivity of companies.

Appendix B:

Interviews with Technical Center Contractor Representatives

B1. Methodology

Senior staff of PERI conducted personal interviews with representatives of the nine largest private contracting firms doing business with the Technical Center. Representatives of the contracting organizations received a letter explaining the purpose of the interview from the director of the Technical Center before being called for an appointment. The interviews took place in April 1997.

The interviews were held at the offices of the contractor and took from 45 minutes to two hours. The respondents received a copy of the topic guide before the interview and most had filled in the requested factual data before the start of the interview (number of employees, firm sites in the eight-county target area, etc.).

The interviewers took notes and also audio taped the interviews for later reference. Those interviewed filled out a form to consent to being audio taped. For the topics dealing with opinion, the interviewers asked open-ended questions (e.g., what are the three greatest strengths of the Technical Center?). Most of those interviewed spoke candidly and often at great length (one noted that he represented his own views and not necessarily those of his firm; another wrote on the consent form that his remarks were not for attribution). We report the findings without reference to the specific individuals or the firms represented. We gratefully acknowledge the cooperation and assistance received from representatives of each firm contacted:

Computer Sciences Corporation (CSC)

Galaxy Scientific Corporation

J.A. Jones, Inc.

Lockheed Martin Air Traffic Management

NYMA, Inc.

Raytheon Services

RMS Technologies

System Resources Corporation (SRC)

Technical & Management Assistance, Inc.

B2. Findings

The following paragraphs present detailed information obtained during the interviews with representatives of the nine largest FAA Technical Center contractors.

B2.1 Economic Impact of the Largest Firms with Technical Center Contracts

The nine firms with the largest FAA contracts at the FAA William J. Hughes Technical Center have 1,038 employees involved in FAA-related work and accounted for over $51 million in employee payrolls within the 8-county area in 1996 (see Table B-1). Almost all of the employees of these nine firms (97%) live in the eight-county Southern New Jersey area. These firms also have 53 subcontracts with other firms - - mostly in the Southern New Jersey area - - involving 415 employees.

B2.1. Local Purchases

Most of the nine firms studied are national or international firms that have a branch serving the Technical Center. Their largest annual local expenditures are for leased office space. Eight out of the nine firms lease office space near the Technical Center; they occupy 140,000 square feet of commercial real estate (see Table B2). While many contractor employees report to work at these offices, others work side-by-side with FAA employees on site at the Technical Center. A few of the firms report that most of their employees work on-site, at Technical Center buildings.

The contractors rely almost exclusively on the local real estate community and local construction firms to provide office space and other services or facilities such as parking lots. The contractor representatives described remodeling, renovations, and expansions to buildings and parking lots that their leasing agents undertook to accommodate contractor needs for office space. Only one of the firms owns an office building in the area but, it also leases office space for part of its operations.

Three out of the nine firms report major purchases of computer and networking equipment in 1996. Because local firms were competitive with non-local bidders, local suppliers received orders for about one million dollars in computer equipment.

For many of the firms, office supplies were an important share of their local purchases. However, a third of the firms purchased their office supplies on national contracts through purchasing divisions located outside of New Jersey. Therefore, local merchants do not usually provide office supplies for these firms. Other services, such as printing and graphics work, and travel-related expenses, such as car rental, plane travel, and hotel accommodations, are also significant expenditures from or through local businesses. The nine largest firms report a total of $5.4 million in local purchases in 1996.

Table B1. Employees and Payroll

For 1996	Largest Contracting Firms		
	Range of Values	Median Value	Total
Number of employees at sites in 8-county area (on Technical Center contracts)	25 - 250	120	1,038
Number of employees At sites in 8-county area also living in the area	25 - 240		118
Payroll for employees living in 8-county area	$2,220,000 - $12,000,000	$5,000,000	$50,870,000
Number of sub-Contractor firms	0 - 10	5	53
Number employed at sub-contractor firms	0 - 150	44	415

Note: Includes estimates in four cases where data unreported.

Table B2. Office Space, New Facilities, and Major Purchases

For 1996	Largest Contracting Firms		
	Range of Values	Median Value	Total
Office space (non-Technical Center sites) in sq. ft.	0 - 20,000	10,500	139,000
Estimated purchases In local area	$127,000 - $1,300,000	$570,000	$5,427,000
New Facilities	None		
Major types of Purchases in Local area	building lease computers and network equipment publications office supplies travel related expenses general supplies renovations electronic and electrical supplies		

B2.2 Views on the Labor Market

Most of the contractors characterize the Technical Center as the "only game in town" for highly technical employment. This situation affects the mobility of high tech employees in the area and limits the pool of potential applicants, a problem that hampers recruitment at both entry and senior levels of employment.

B2.2.1 Limited Mobility

In contrast to areas known for their high tech work force such as the Silicon Valley, Route 128 in Massachusetts, Research Triangle in North Carolina, or Washington, DC, the Southern New Jersey area has limited employment opportunities. If a firm loses a contract, alternative employment opportunities are limited to the winning contractor or other local firms because, "it's not like you're in DC where there are 500 jobs to choose from."

There is a limited pool of applicants for jobs that open. Career advancement often involves getting a job with another Technical Center contractor. One executive said that once recruited, employees tend to stay in the vicinity of South Jersey because they like the area. He notes that, as a result, he has extremely low turnover among staff.

It is difficult for contractors to get their employees to relocate to the DC area because of drawbacks such as traffic congestion, faster paced lifestyle, and a higher cost of living; "You offer them a 25% raise to go to DC and they turn you down." They believe that the same factors affect Technical Center employees who are asked to work in the Washington area.

Contractors would like to see more cutting-edge firms in the area, with clients other than the Technical Center, so employees would have less concern about their next job. They mention software development as a potential opportunity for existing or new firms in the area since the costs for labor, space, and other operations are favorable, and they see software development as an activity that can take place anywhere.

B2.2.2 Recruitment Difficulties

Contractors report difficulty in recruiting senior staff because of the Technical Center's location in New Jersey. Some firms recruit a limited number of senior employees, preferring to "train and grow talent in house since it takes 3 years for software engineers to learn the business." Those that recruit senior staff from outside the area report an initial reluctance to relocate to Southern New Jersey because of the relative obscurity of the Technical Center and lack of information about the Technical Center and the area where it is located.

Initially, many potential employees associate the Technical Center with unflattering stereotypes associated with the state, even though the Technical Center is in a rural setting several miles from Atlantic City. To counteract these views, contractors use various strategies in recruitment, such as having a potential employee and their family visit the area to correct any stereotypes about the Southern New Jersey area. On the other hand, one contractor says that several staff specialists commute from New York City or other areas and rely on e-mail to keep in touch with other colleagues in their field of expertise because they fear professional isolation in Southern New Jersey.

In order to recruit entry level personnel, the contractors visit schools in the New Jersey, Pennsylvania, Maryland, and Delaware area. They also go beyond these nearby states, particularly when they recruit for individuals with training in human factors or other specialty areas. One contractor noted that the nation's well-known high tech areas (e.g., Research Triangle, Silicon Valley, etc.) all had universities that were closely involved in the high tech research and development of local firms. None of the Technical Center's neighboring universities or colleges seems to have strong and established ties or interests in working with Technical Center staff or personnel.

B2.2.3 Strengthening the Labor Market in Southern New Jersey

The contractors perceive various advantages to closer relations between the Technical Center and neighboring universities and colleges, particularly for involving academics in research related to Technical Center concerns. A related advantage would be the development of stronger educational programs in Technical Center specialties, including electrical engineering, systems analysis, computer science, and human factors.

The contractors see a wider need for regional and state efforts to bring other types of research organizations and firms to the area to expand the market for high tech skills and the pool of professional talent working in the area. One contractor notes that not all the New Jersey colleges are "Technical Center friendly." He sees a need for Technical Center staff to work more closely with colleges and universities so that their curricula are more relevant to the needs of the Technical Center.

Another contractor reports that in the past his firm had benefited from co-operative employment programs and summer intern programs, but that the Center had cut back on such programs in recent years. Previously, his firm has hired former interns or co-op students for summer jobs or entry-level jobs in subsequent years. Continuation and expansion of programs of this type are necessary to encourage educational institutions to work more closely with the Technical Center and its contractors.

B2.3 New Opportunities for the Technical Center

In response to a question about the three most important contributions of the Technical Center, most of those interviewed mention testing, evaluation, or maintenance functions related to air traffic control systems; they are equally likely to mention safety related to aircraft and facilities (see Table B3). A few also note contributions that the Technical Center, its personnel, and its employment opportunities have on the local economy, on local educational institutions, and for community-related activities.

B2.3.1 Current Mission of Technical Center and New Opportunities

The Technical Center is currently best known for its testing, evaluation, and maintenance of air traffic control systems and for safety-related work for aircraft and facilities. It is less well known for basic research and development. One contractor sees the Technical Center as preeminent in risk management and capable of performing an enhanced role in research and development beyond its acknowledged expertise in evaluation and maintenance. Contractors cite various security systems - - the CTX 5000, for detection of explosives in luggage, and the Traffic Alert and Collision Avoidance System (TCAS) - - as important examples of Technical Center research and developmental capabilities. They note that the Technical Center could be the industry leader in security work related to aviation.

Contractors see opportunities for Technical Center expand work with federal agencies such as NASA, the Department of Defense, the Air Force, and the Department of Transportation. The commercial environment (e.g., private airlines and airplane manufacturers) also has research

Table B3. Major Contributions of the Technical Center, According to Contractor Representatives

Category	Mentions
Air Traffic Control System	
Shakedown/pre-deployment/tests/evaluation of ATC systems	7
Field support of ATC systems: emergency response, trouble-shooting, and upgrades	5
Safety of Aircraft, Passengers, and Facilities	
Fire and chemical safety and related topics	3
Aircraft safety (e.g., aging aircraft, TCAS conflict alert)	4
Security of passengers and aircraft (e.g., CTX 5000)	4
Airport pavement tests	1
Contributions to Economic and Social Environment	
Staff/employee contributions to area	2
Employment of technologically trained students/other	1
Economic impacts	1
Outreach to schools in area	1

needs that the Technical Center can meet. The future of the Technical Center and that of their own companies will involve identifying projects to meet the needs of clients outside of the Technical Center while continuing to work with current clients.

One contractor suggests initiation of a task force on a tight time line to review new initiatives for the Technical Center and its associated contractors, (e.g., testing space systems). He advocates a Total Quality model involving solicitation of ideas from "grass roots" personnel as well as from top management of both the Technical Center and private firms. He notes that such efforts to pursue new areas of work will affect Technical Center operations, (e.g., priorities with respect to meeting budgets and deadlines).

B2.4 Highlighting Technical Center Accomplishments

One contractor calls for highlighting the Technical Center as "a high tech national treasure with unique capabilities." However, it is difficult to convey the magnitude and complexities involved in evaluating, maintaining, or upgrading air traffic control systems that contractors agree are the current major contributions of the Technical Center.

Another contractor notes that most of the news about the Technical Center is either highly technical or involves a crisis. He notes than when conflict alert situations occurred in the spring of 1997 involving planes equipped with conflict alert systems, the Technical Center role in developing this equipment was not mentioned in local TV news coverage of the events.

The Technical Center could do a better job of highlighting the contribution that its staff and associates make in their work with students from elementary to university levels. For instance, Technical Center personnel are invariably represented on panels of judges for science fairs throughout Southern New Jersey.

Tourists and visitors to Atlantic City and the New Jersey shore rarely know that the Technical Center exists nearby. The Technical Center could be a welcome side trip for visitors to casinos and beaches, but the Atlantic City Chamber of Commerce does not offer much information about the Center. In addition, the Technical Center is not currently particularly visitor-friendly to tourists or casual visitors.

Some contractors suggest developing the Technical Center as a cultural attraction within the Atlantic City area. Their recommendations include:

a) Develop an interactive educational center that explains the major activities of the Technical Center, such as, how en route and terminal controllers' work, weather activities, pilot takeoff and landing situations, and exhibits featuring safety features (TCAS, ATC enhancements, fire prevention). The educational center could start with exhibits already available such as those done by the African American Aviators and for women's month. Donations and grants from the aviation community could be sought as well as appropriations from Congress and the state. Examples of aviation-related attractions include the aviation center at the Baltimore-Washington International Airport in Maryland, the NASA Space Center at Cape Kennedy in Florida, and the Air and Space Museum in Washington, DC.

b) Work with the Atlantic City Chamber of Commerce, casino organizations, and others to ensure that the Technical Center is included in promotional materials, including the web pages under development.

c) Continue the tradition of opening up the base and the Technical Center to the general public on an annual or more frequent basis.

Appendix C:

Technical Center Employee and Contractor Community Involvement Survey

C1. Introduction

The following paragraphs present detailed information obtained from the Employee Community Involvement Survey. Wording of specific questions is provided following the tables presenting the data.

C2. Method

Short questionnaires were sent by mail to Technical Center employees and distributed at job sites by the nine largest contracting firms doing business with the Technical Center. Employees returned the survey to PERI using a postage-paid business reply envelope. There were 588 usable surveys returned, a response rate of 23% from both Technical Center employees and from contractor employees - - a typical response rate for a single mailing or distribution of a survey questionnaire. The returns were weighted to represent the entire population of Technical Center and contractor employees, a total of 2,580 individuals (see section C4.1 for details on the weighting process). The term, employees, in the report refers to both Technical Center employees and contractor employees except where specific reference is made to a particular group.

C2.1 Findings Volunteer Activity of Technical Center and Contractor Households

Among the employees of the William J. Hughes Technical Center and the contractors, 73% (1,891 individuals) participated in volunteer activity in the previous year. In addition, half of the employees (1,279 out of 2,580) report that a spouse or partner did volunteer activity in 1996. Among all employee households (with or without spouses or partners) almost four out of five (78% or 2,021 households) have one or more volunteers.[5] See Tables C1 and C2.

[5] The total of 2,021 is the sum of households where the employee volunteers (1,891) plus the number of households where the spouse/partner volunteers although the employee does not (130).

Table C1. Volunteer Status for all Households, 1996

Volunteer Status	Number	Percent of Total
Households	2580	100.0
Employee volunteers	1891	73.3
Spouse/partner volunteers	1279	49.6
Employee &/or spouse/partner volunteer	2021	78.3
Both employee & spouse/partner volunteer	1149	44.5
Neither employee or spouse/partner volunteers	401	15.5

See Table C2 for wording of questions.

Table C2. Volunteer Status for Households with a Spouse/Partner, 1996

Volunteer Status	Number	Percent of Total
Households with spouse/partner	2077	100.0
Spouse/partner volunteers	1279	61.6
Both employee & spouse/partner volunteer	1149	55.3
Neither employee or spouse/partner volunteers	401	19.3
Only spouse/partner volunteers (employee does not)	130	6.3

Q1. In the past year (1996 through now in 1997), have you participated in any kind of unpaid volunteer activity?

Q11. In the past year (1996 - 1997), has your spouse/partner participated in any kind of unpaid volunteer activity?

C2.1.1 Hours contributed in 1996

Employees estimated the number of hours that they and any spouse or partner volunteered in the previous year. The median number of hours is 140 hours per year per volunteering household (see Table C3). In other words, half the households volunteered more than 140 hours and half volunteered less than 140 hours in 1996. Using the median as an average, in 1996 the overall contribution of all volunteering households was 282,940 hours (2,021 households times 140 hours/household). To express this another way, if 2,000 hours a year are the equivalent of a full-time job, then all of the volunteering households contributed the equivalent of 141.5 individuals working full-time jobs in 1996.

Table C3. Hours Contributed in Past Year (1996) and Annual Value for Households with Volunteers @ $13.23/Hour in 1996

Household	Hours	Annual Value
Median	140	$1,852.20
Total: All Volunteer Activity	282,940	$3,743,296.20
Full-Time Equivalent	Workers	Salary
	141.5	$26,460.00

A national study of volunteering applies a value equivalent to an average hourly wage to hours volunteered to develop a conservative estimate of the value of the time volunteered (Hodgkinson et al., 1996). Using a value of $13.23 per hour for 1996, the median Technical Center employee/contractor household contributed the equivalent of $1,852.20 in time in 1996.[6] For all of the volunteering households, this represents over $3.7 million dollars in volunteered time.

C2.1.2 Type of Activities Reported by Volunteering Households

The top three types of organizations to receive volunteer aid are religious, civic, and educational organizations; over 40% of the households report doing volunteer work in these areas (see Table C4). A third of households are involved in recreation activities; another third contribute time to human or social service organizations. One out of ten households has a volunteer in activities that are related to their neighborhood, to arts or cultural activities, or to public safety.

Q5. In the past year of 1996 and through now in 1997, how many hours total did you work in all of

the volunteer activities in which you participated? Your best estimate is fine.

Q15. In the past year of 1996 and through now in 1997, how many hours total did your spouse/partner

work in all of the volunteer activities in which she/he participated? Your best estimate is fine.

1 Less than 5 hours 2 6 - 40 hours 3 41 - 100 hours 4 101 - 200 hours

5 201 - 300 hours 6 301 - 400 hours 7 More than 400 hours -- ESTIMATE: _____

[6] The value of $13.23/hour represents a 3% increase in the Gallup figure of $12.84 used to calculate the value of time contributed for volunteer activities in 1995. The median was chosen over the mean (also known as the arithmetic average) because it is generally a more representative average (and more conservative) than the mean.

Table C4. Types of Volunteer Activities, for all Volunteers, 1996

Type of Activity	Percent of Households Participating
Religious	46
Civic	43
Educational	42
Recreation	34
Human or social service	33
Neighborhood	13
Arts/culture	13
Public safety	10
Political activity	8
Business, trade, ethnic	4
Self-help group, other public interest	3
Other	2

Q2. Volunteers: Please circle all the areas in which you have done volunteer work in the past year (1996 - 1997)

C2.1.3 Volunteer Activity Reported by Technical Center Employees and Contractor Employees

The following section reviews the voluntary activities of the Technical Center and contractor employees; 73% report participating in an unpaid volunteer activity; 27% do not volunteer (refer to Table C1). Men and women employees are equally likely to report volunteering. Three out of four women employees (75%) report that they are volunteers, and a similar proportion of the men volunteer (72%). There is also no difference between Technical Center and contractor employees in terms of volunteering (see Table C5).

Table C5. Employee Participation (Volunteer Status) by Technical Center Employee Status, by Gender and for Spouses/Partners, Where Present

Employee Status/Gender	Percent Volunteering
All Employees	73
Technical Center employees	75
Contractor employees	70
Women	75
Men	72

Q9. Are you employed by the FAA or by a contractor employee?

Q10. What is your gender?

C2.1.4 Type of Volunteer Activities

The top five types of organizations to receive volunteer aid are religious, civic, educational, recreation, and human or social service organizations (see Table C6a). Thirty percent or more of employees are involved in these types of organizations. About one out of ten employees have a volunteer activity in the area of public safety, neighborhood-related activities, or arts and cultural activities. These commitments are similar to those reported for households, that is, for employees along with their spouse/partners reported earlier in Table C4.

One out of 14 employees who volunteer (7%) hold a position in government - - at a local, county, state, or regional level. Among spouse/partners who volunteer, about the same proportion (7%) have a position in government (see Table C6b).

Table C6a. Type of Activities Reported by Employees Who Volunteer, 1996

Type of Activity	Percent of Employees Participating
Religious	41
Civic	38
Educational	32
Human or social service	30
Recreation	30
Neighborhood	12
Arts/culture	11
Public safety	9
Political	6
Self-help group, other public interest	3
Business, trade, ethnic	3
Other	1

Q2. Volunteers: Please circle **all** the areas in which you have done volunteer work in the past year (1996 - 1997)

Table C6b. Participation in Government Activity, 1996

Employee or Spouse/Partner	Percent of Volunteers With a Position in Local, County, State or Regional Government
Employee	7
Spouse/Partner	7

Q. 8. Do you currently have a position in local, county, state or regional government?

Q. 16. Does your spouse/partner have a position in local, county, state or regional government?

C2.1.5 Number of Organizations Involved

Most employee volunteers work with more than one organization (see Table C7). Of those employee volunteers indicating the number of organizations that they work with, 30% noted one organization that they work with; 29% list two organizations; and 41% listed three or more specific organizations. There is no difference between men and women in terms of number of organizations reported.

Table C7. Number of Organizations That Employees Volunteered With, by Gender, 1996

Number of Organizations	Women	Men	Total
1	31	30	30
2	29	29	29
3+	41	41	41
Total	100	100	100

Note: Due to rounding, columns do not necessarily add to 100%.

Q3. Please list up to three specific organizations or agencies you have done volunteer work for in the past year (1996-1997).

Thirteen percent of all employees who volunteered did not list the organizations that they work with and are not included in the distribution above.

C2.1.6 Schedule or Basis for Volunteer Activity

Two out of three (68%) of employees who are volunteering say that they do so on a regular, on-going basis (see Table C8). Thirty percent report volunteering on a seasonal basis and about half (46%) also report volunteering on an occasional basis.

Table C8. Type of Volunteer Schedule for Employee Volunteers, 1996

Type of Schedule	Percent of Employees Volunteering
On-going basis	68
Seasonal basis	30
Occasional basis	46

Note: Respondents were asked to circle all that apply; percents do not add up to 100%.

Q4. On what basis have you volunteered over the last year (1996-1997)? (CIRCLE ALL THAT APPLY)

1. On an on-going basis (weekly/monthly throughout the year)

2. On a seasonal basis (spring/summer/fall/winter)
3. On an occasional basis (special events, one-time need)

C2.1.7 Reasons employees give for volunteering

Technical Center and contractor employees give many and various reasons for volunteering; almost all (86%) say that they find volunteering to be personally rewarding (see Table C9). A recent national survey by Yankelovich Partners for the Lutheran Brotherhood in March 1997 found that 71% of volunteers say they volunteer because "they enjoy it", (Oldenburg, D., 1997). Other reasons that are important to the Technical Center and contractor volunteers include:

They believe in the group or organization's mission or purpose (63%),

They meet new people (41%); and,

They want to instill the values of the organization or activity in their children (40%).

Table C9. Employee Reasons for Volunteering, 1996

Reasons for Volunteering	Percent of Employees
I find it personally rewarding	86
I have a commitment to the mission or purpose of the organization/group	63
I meet new people	41
I want to instill in my child(ren) the values that the organization or activity promotes	40
I want to be involved with my child(ren)	35
I enjoy the change of pace from my daily routine	31
I use skills I don't or can't use in my job	29
I enjoy the challenge of working on solutions to community problems	25
I learn new skills	24
It helps me or a member of my family	20
It helps me develop my career	7
I want to give back to the community	3
Other reasons	7

Q6. What are the main reasons you choose to volunteer? (CIRCLE ALL THAT APPLY)

C2.1.8 Comments About the Survey

Fifteen percent of the employees commented on the survey (see Table C10). One in five of their comments dealt with reasons why the employee did not volunteer, including lack of time, family demands, health reasons, or other circumstances. Other comments addressed the positive aspects of volunteering, views about the survey itself, discussion of how volunteering affects the employee's life and community, and reminders that those who do not volunteer may give contributions of cash and other items as part of their support for volunteer activities.

Table C10. Comments About Volunteering or About the Survey

EMPLOYEE COMMENTS	Percent
Positive mention of volunteering	27
Other miscellaneous comments	26
Reason for not volunteering	21
Impact of volunteering on employee's community and life	15
Favoring survey	8
Disapproval of survey	3

C3. Conclusions

The results of the survey indicate that the Technical Center and contractor employees contribute extensively to local community volunteer activities. This report has simply sketched the overall totals and descriptive statistics. The details about the motivations, satisfactions, and specific contributions of the volunteers deserve detailed investigation and publication.

A total of 263 individuals provided contact information so that they could be interviewed for a newspaper story about their volunteering activities. This is a large pool of individuals for potential publicity about community contributions; the stories could be published in Technical Center sponsored publications as well as in community media. If one individual were interviewed each week, it would take several years to interview all of these volunteers.

Table C11. Employee and/or Spouse Provided Identification for Further Contact

Identification Provided For...	Number	Percent of all Respondents
Employee	177	30.1
Spouse or Partner	86	14.6

The questionnaire requested identification of self and/or spouse/partner for follow-up about volunteer activities.

C4. Methodology, Weighting Notes, and References

The survey of voluntary activities among has two populations.

1) Employees of the Technical Center in Atlantic City (and their spouse/partners) and

2) Contractor employees at nine firms who work on Technical Center-related contracts (and their spouse/partners).

The questionnaires were distributed by mail to the homes of Technical Center employees. Contractor representatives received surveys for distribution to their employees. The responding employees reported on their own activities and, if relevant, on those of their spouse/partner.

The returns were weighted to reflect the entire population of employees (both Technical Center and contractors) in order to estimate the total contribution of voluntary activities from employees associated with the William J. Hughes Technical Center for the surrounding community.

C4.1. Weighting

Usable responses were weighted to population totals for Technical Center or contractor employee, by gender. We expected about a 25% return for the mail questionnaire (with no reminder and no second wave) sent to Technical Center employees. We expected a somewhat lower response rate from contractor employees; however, final response rate at the cutoff date for acceptance of returns was 23% for both groups (see Table C12).

C4.1.1 Weighting of Technical Center Employees and Contractor Employees

This procedure was straight forward and involved two variables: Technical Center or contractor employee status and gender. The Human Resource Office of the Technical Center provided information on total number of employees and the composition by gender of the Technical Center work force. In interviews, contractor representatives provided the number of employees for each of the nine firms and the number of female and male employees. The weights are moderate and consistent; they range from 4.1 to 4.6 (see Table C12).

Table C12. Weights for FAA and Contractor Employees, by Gender

Employee/Gender	Total	Responses		Weight
		Number	Rate	
All Employees	2580	588	23%	n/a
Technical Center Employees	1542	354	23%	n/a
Female	470	115	25%	4.0870
Male	1072	239	22%	4.4854
Contractor employees	1038	234	23%	n/a
Female	339	73	22%	4.6397
Male	699	161	23%	4.3435

Note: n/a = not applicable

C4.1.2 Analysis of Differential Responses

The weighting approach incorporates that view that those who return surveys are similar to those who do not. In particular, we have assumed:

- that marital status and spouse/partner activities of those who return surveys are similar to those who do not return surveys;
- that there is a limited number of cases in which both partners in a household work for the Technical Center and/or one of the participating contractors; and
- the likelihood of participating in volunteer activities among employees who responded to the survey is similar to those who did not respond.

We reviewed the evidence for the last assumption. National surveys indicate that 50-55% of U.S. adults do some type of volunteer work. The Washington Post-ABC News poll of April 21-24 found that 55% of randomly selected adults interviewed by phone said "yes" when asked, "In the last year or so, have you done any volunteer work for any church, charity or community?" ("Volunteering in America", 1997). The semi-annual national survey conducted for the Independent Sector by the Gallup Organization found that 49% of adults volunteered in 1995, for an average of 4.2 hours per week (Hodgkinson et al., 1996).

The Gallup Survey has also found that volunteering is strongly related to educational levels; the more education, the more likely that an individual will volunteer work. For instance, 71% of households with a college graduate reported volunteering in the most recent Gallup Survey compared to 43% of those with a high school education (Hodgkinson et al., 1996); (U.S. Statistical Abstract, 1996-1997). Employees of the Technical Center and its contractors tend to be highly educated and the estimate of 73% for their volunteering rate in 1996 parallels the

national estimate of 71% for volunteering among college educated individuals that the Gallup survey reports.

We also compared the earlier questionnaires returned to those coming in later within the six week time period during which the surveys were returned. Whether looking at the first half compared to the second half or comparing the results over three segments, the proportion of employees who report volunteering remains essentially the same, within one or two percentage points.

C4.1.3 Estimate of Hours and Value of Hours

The Technical Center questionnaire asked for an estimate of volunteer hours for the past year where the past year was defined as "1996 through now in 1997." The period of survey administration was from early April through mid-May, 1997. The choices given to employees were ranges of hours (that's 101 to 200 hours). To calculate hours for individuals, we used a conservative approach of assigning the midpoint of the range of hours given (e.g., if a employee checked the range of 101 to 200 hours, we assigned 150 hours to the case as the estimate of employee hours contributed). In addition, national studies indicate that informal volunteer activities, that is, activities done outside of organizations, including baby sitting (for family, friends, or neighbors), elder care, and other activities account for about a fourth of volunteer hours overall (23% of volunteered hours in the 1995 Gallup study) (Hodgkinson et al., 1996). Therefore, although employees in this study may have been reporting on slightly more than a year (possibly on 5 quarters, that is, all of 1996 and part of 1997), we still consider the hours reported to be a conservative estimate of all volunteer activity since we did not specifically ask about informal volunteer activities.

Our projection of hours for all employees and their households is based on the median hours reported by volunteers. The median is a conservative measure of central tendency which, unlike the arithmetic mean, is not strongly affected by the highest values of a distribution. Therefore, we view the overall estimate of contributed hours for all employees and their households and the related estimate of monetary value of those hours as a moderate and conservative estimate.

The data reported in the survey are also subject to normal sampling error, as noted in Table C13.

Table C13. Standard Errors Associated with Estimates for Percentages

Category	Number of Unweighted Returns	Standard Error Associated with Estimates
All employees	588	±4.1
Technical Center employees	354	±5.3
Contractor employees	234	±6.5
Technical Center		
Women	115	±9.3
Men	239	±6.4
Contractor		
Women	73	±11.7
Men	161	±7.9
All Women	188	±7.3
All men	400	±5.0

C4.2 Coding Specifications

Employee Community Involvement Survey Keying/Data Layout and Codes

Q#	QUESTION	# Cols	Values
#	Serial Number	1,4	
1	In the past year have you participated in any kind of unpaid volunteer activity?	5,1	1 Yes, 2 No
2	Volunteers: Please circle all the areas in which you have done volunteer work in the past year (1996 - 1997): 1 Arts/Culture (comm. thtr, local arts council, etc.) 2 Civic (comm. organizations, etc.) 3 Education (tutor, PTA, school bd, Bd of Ed, etc.) 4 Human/Soc Servs (Red X, shelters, soup kit., etc.) 5 Neighborhood (safehouses, neighbhd watch, etc.) 6 Political (planning/zoning boards, councils, etc.) 7 Public Safety (firefighter, resc. squad, police, etc.) 8 Recreation (coach youth sports, teach crafts, etc.) 9 Religious (usher, Sunday school teacher, etc.) 10 Self Help / Public Interest (AA, Environmental, etc.) 11 Business/Trade or Ethnic 12 Other --	6,12	One column for each of twelve entries; for each column/entry, 1 if circled, blank if left blank
3	Please list up to three specific organizations or agencies you have done volunteer work for in the past year (1996 - 1997).	18,1	Number of organizations listed
4	On what basis have you volunteered over the last year?	19,3	Three entries, one column for each entry, 1 if circled, blank if left blank
5	In the past year, how many hours total did you work in all of the volunteer activities in which you participated?	22,5	First of four columns = 1 Less than 5 hours 2 6 - 40 hours 3 41 - 100 hours 4 101 - 200 hours 5 201 - 300 hours 6 301 - 400 hours 7 More than 400 hours additional four columns will be filled in if previous column = 7; enter the no. given, otherwise blank

Q#	QUESTION	# Cols	Values
6	What are the main reasons you choose to volunteer? 1 Find it personally rewarding. 2 Have a commitment to mission/purpose of org/grp. 3 Enjoy challenge of working on sol's to common probs. 4 Want to instill in my child values of org or act'y. 5 I want to be involved with my child(ren). 6 It helps me or a member of my family. 7 I enjoy the change of pace from my daily routine. 8 I learn new skills. 9 I use skills I don't or can't use in my job. 10 It helps me to develop my career. 11 I meet new people 12 Other 13 I want to give back to the community	27,13	One column for each of thirteen entries; for each column/entry, 1 if circled, blank if left blank
7	Would you allow a description of one or more of your volunteer activities to appear in publicly distributed literature about how the William J. Hughes Technical Center benefits the local community?	40,1	1 Yes, 2 No
8	Do you currently have a position in local, county, state or regional government?	41,1	1 Yes, 2 No
9	Are you employed by the FAA or by a contractor employee?	42,1	1 FAA 2 Contractor
10	What is your gender?	43,1	1 Female 2 Male
11	In the past year, has your spouse/partner participated in any kind of unpaid volunteer activity?	44,1	1 Yes, 2 No

Q#	QUESTION	# Cols	Values
12	Please circle all the areas in which your spouse/partner has done volunteer work in the past year (1996 - 1997). 1 Arts/Culture (comm. thtr, local arts council, etc.) 2 Civic (comm. organizations, etc.) 3 Education (tutor, PTA, school bd, Bd of Ed, etc.) 4 Human/Soc Servs (Red X, shelters, soup kit., etc.) 5 Neighborhood (safehouses, neighborhood watch, etc.) 6 Political (planning/zoning boards, councils, etc.) 7 Public Safety (firefighter, rescue squad, police, etc.) 8 Recreation (coach youth sports, teach crafts, etc.) 9 Religious (usher, Sunday school teacher, etc.) 10 Self Help / Public Interest (AA, Environmental, etc.) 11 Business/Trade or Ethnic 12 Other --	45,12	One column for each of twelve entries; for each column/entry, 1 if circled, blank if left blank
13	Please list up to three specific organizations or agencies you have done volunteer work for in the past year (1996 - 1997).	57,1	Number of organizations listed
14	On what basis has your spouse/partner volunteered over the last years (1996 - 1997)?	58,3	Three entries, one column for each entry, 1 if circled, blank if left blank
15	In the past year of 1996 and through now in 1997, how many hours total did your spouse/partner work in all of the volunteer activities in which she/he participated? Your best estimate is fine.	61,5	For first column 1 Less than 5 hours 2 6 - 40 hours 3 41 - 100 hours 4 101 - 200 hours 5 201 - 300 hours 6 301 - 400 hours 7 More than 400 hours if previous column = 7, additional cols = # given
16	Does your spouse/partner have a position in local, county, state or regional government?	66,1	1 Yes, 2 No
17	Would your spouse/partner be interested in having a descriptions of his/her activities appear in publicly distributed literature about how the WJH Technical Center benefits the local community?	67,1	1 Yes, 2 No

Q#	QUESTION	# Cols	Values
18	Comments about volunteering or about this survey in the space below or on a separate page	68,1	One number from 1 through 8 or blank if left blank 1 = Did not vol. because.. 2 = Pos about volunteerism 3 = Pro survey 4 = Anti Survey 5 = Details about selves regarding volunteering and its impact on their community/lives 6 = Keep tech center here 7 = Not yet designated 8 = Other
19	Check for follow up about volunteer activities and fill in name and number below.	69,1	1 if checked, blank not checked
	Name and telephone	70,25 95,10	Key if given, blank if not
	Spouse/partner names and telephone	105,25 130,10	Key if given, blank if not

C4.3 References

Hodgkinson, V.A., et al. *Giving and Volunteering in the United States: Findings from a National Survey, 1996 ed.* Washington, DC: Independent Sector, 1996.

Oldenburg, Don. "Volunteers: Helpers From Hell, *Washington Post* (May 6, 1997), p. D5.

U.S. Statistical Abstract, 1996-1997, Tables 608-610.

"Volunteering in America," Washington Post (April 29, 1997), p. A8.